Power Triode

GENERAL DATA

Electrical:

Filament, Thoriated Tungsten:		
Voltage (AC or DC)	6.3	volts
Current	4	amp
Amplification Factor	160	
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	5.6	pf
Grid to filament	5.9	pf
Plate to filament	0.7	pf

Mechanical: ←

Operating Position	Vertical, base down; or Horizontal, pins 1 & 4 in vertical plane
Maximum Overall Length	6-15/32"
Seated Length	5-11/16" ± 5/32"
Maximum Diameter	2-7/16"
Weight	2.7 oz
Bulb	ST19
Cap	Medium (JEDEC No.C1-5)
Base	Medium-Shell Small 4-Pin Micanol with Bayonet (JEDEC No.A4-10)
Basing Designation for BOTTOM VIEW	3G

Pin 1 - Filament
Pin 2 - Do Not Use
Pin 3 - Grid
Pin 4 - Filament
Cap - Plate

AA' = PLANE OF ELECTRODES

AF POWER AMPLIFIER & MODULATOR — Class B

Maximum Ratings, *Absolute-Maximum Values:*

	CCS[a]	*ICAS*[b]	
DC PLATE VOLTAGE	1250 max.	1500 max.	volts
MAX.-SIGNAL DC PLATE CURRENT	175 max.	175 max.	ma
MAX.-SIGNAL PLATE INPUT	165 max.	235 max.	watts
PLATE DISSIPATION[c]	45 max.	65 max.	watts

Typical Operation:

Values are for two tubes[d]

DC Plate Voltage	750	1250	1000	1250	1500	volts
DC Grid Voltage[e]	0	0	0	0	-4.5	volts
Peak AF Grid-to-Grid Voltage	197	145	185	175	170	volts
Zero-Signal DC Plate Current	32	50	44	54	32	ma

← Indicates a change.

	CCS		ICAS			
Max.-Signal DC Plate Current	350	260	350	350	313	ma
Effective Load Resistance (Plate to plate).	5100	12400	7400	9200	12400	ohms
Max.-Signal Driving Power (Approx.) . .	9.7	3.8	7.5	6.0	4.4	watts
Max.-Signal Power Output (Approx.). .	178	235	248	310	340	watts

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum Ratings, *Absolute-Maximum Values:*

	CCS	ICAS	
DC PLATE VOLTAGE.	1000 max.	1250 max.	volts
DC GRID VOLTAGE	-200 max.	-200 max.	volts
DC PLATE CURRENT.	125 max.	150 max.	ma
DC GRID CURRENT	50 max.	50 max.	ma
PLATE INPUT	115 max.	175 max.	watts
PLATE DISSIPATION	30 max.	45 max.	watts

Typical Operation:

	CCS	ICAS	
DC Plate Voltage.	1000	1250	volts
DC Grid Voltage:[f]			
From a grid resistor of:			
1200 ohms	-55	-	volts
2700 ohms	-	-120	volts
Peak RF Grid Voltage.	150	250	volts
DC Plate Current.	115	140	ma
DC Grid Current (Approx.)[g]. . .	45	45	ma
Driving Power (Approx.)[g]. . . .	6.1	10	watts
Power Output (Approx.).	88	135	watts

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[h]

Maximum Ratings, *Absolute-Maximum Values:*

	CCS	ICAS	
DC PLATE VOLTAGE.	1250 max.	1500 max.	volts
DC GRID VOLTAGE	-200 max.	-200 max.	volts
DC PLATE CURRENT.	175 max.	175 max.	ma
DC GRID CURRENT	50 max.	50 max.	ma
PLATE INPUT	175 max.	260 max.	watts
PLATE DISSIPATION	45 max.	65 max.	watts

Typical Operation:

	CCS	ICAS	
DC Plate Voltage.	1250	1500	volts
DC Grid Voltage:[j]			
From a grid resistor of:			
1100 ohms	-50	-	volts
1750 ohms	-	-70	volts



From a cathode resistor of:			
270 ohms	-50	-	volts
330 ohms	-	-70	volts
Peak RF Grid Voltage	140	175	volts
DC Plate Current	140	173	ma
DC Grid Current (Approx.)[g]	45	40	ma
Driving Power (Approx.)[g]	5.7	7.1	watts
Power Output (Approx.)	135	200	watts

SELF-RECTIFYING AMPLIFIER[k] — Class C

Maximum CCS Ratings, *Absolute-Maximum Values:*

AC PLATE VOLTAGE (RMS)	1750 max.	volts
DC GRID VOLTAGE	-125 max.	volts
DC PLATE CURRENT	65 max.	ma
DC GRID CURRENT	25 max.	ma
PLATE INPUT	125 max.	watts
PLATE DISSIPATION	45 max.	watts

Typical Operation in Push-Pull Circuit at 27 Mc:

Values are for 2 tubes

AC Plate Voltage (RMS)	1750	volts
DC Grid Voltage:[f,m]		
From a grid resistor of:		
1500 ohms	-70	volts
DC Plate Current	130	ma
DC Grid Current (Approx.)	46	ma
Driving Power (Approx.)[n]	12	watts
Power Output (Approx.)	175	watts
Useful Power Output (Approx.)– 75% circuit efficiency	130	watts

AMPLIFIER[k] — Class C

With Separate, Rectified, Unfiltered, Single-Phase, Full-Wave Plate Supply

Maximum CCS Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	1125 max.	volts
DC GRID VOLTAGE	-125 max.	volts
DC PLATE CURRENT	160 max.	ma
DC GRID CURRENT	45 max.	ma
PLATE INPUT	175 max.	watts
PLATE DISSIPATION	45 max.	watts

Typical Operation:

DC Plate Voltage	1125	volts
DC Grid Voltage:[f,m]		
From a grid resistor of:		
1400 ohms	-35	volts
DC Plate Current	125	ma
DC Grid Current (Approx.)	25	ma
Driving Power (Approx.)[k]	3	watts
Power Output (Approx.)	135	watts

→ **LINEAR RF POWER AMPLIFIER — Class AB_2**

Single-Sideband Suppressed-Carrier Service

Maximum Ratings, *Absolute-Maximum Values up to 30 Mc:*

	CCS	ICAS	
DC PLATE VOLTAGE	1250 max.	1500 max.	volts
DC PLATE CURRENT:			
Max.-Signal (Single-Tone) or Peak-Envelope (Two-Tone)	175 max.	175 max.	ma
DC GRID CURRENT	50 max.	50 max.	ma
DC PLATE INPUT:			
Max.-Signal (Single-Tone) or Peak-Envelope (Two-Tone)	165 max.	235 max.	watts
PLATE DISSIPATION	45 max.	65 max.	watts

Typical Operation with "Single-Tone" Modulation:[q]

DC Plate Voltage	1250	1500	volts
DC Grid Voltage[r]	0	-4.5	volts
Zero-Signal DC Plate Current	25	16	ma
Effective RF Load Resistance	5700	6000	ohms
DC Plate Current	130	157	ma
DC Grid Current	30	30	ma
Peak RF Grid Voltage	78	88	volts
Driver Power Output, (Approx.)[s]	7	8	watts
Output-Circuit Efficiency (Approx.)	90	90	%
Useful Max.-Signal Power Output (Approx.)	120[t]	160[t]	watts

Typical Operation with "Two-Tone" Modulation at 30 Mc:[u]

DC Plate Voltage	1250	1500	volts
DC Grid Voltage[r]	0	-4.5	volts
Zero-Signal DC Plate Current	25	16	ma
Effective RF Load Resistance	5700	6000	ohms
DC Plate Current:			
Peak-Envelope	130	157	ma
Average	91	110	ma
Average DC Grid Current	20	20	ma
Peak-Envelope Driver Power Output (Approx.)[s]	7	8	watts
Output-Circuit Efficiency (Approx.)	90	90	%
Distortion Products Level:[v]			
Third order	-26	-25	db
Fifth order	-32	-30	db
Useful Power Output (Approx.):			
Peak-Envelope	120[t]	160[t]	watts
Average	60[t]	80[t]	watts

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Filament Current	1	3.75	4.25	amp
Amplification Factor	1,2	144	176	
Grid-Plate Capacitance	–	4.9	6.3	pf
Grid-Filament Capacitance	–	4.9	6.9	pf

→ Indicates a change.

Plate-Filament Capacitance.	-	0.52	0.88	pf
Plate Current	1,3	16	36	ma
Grid Current.	1,4	25	85	ma
Useful Power Output	1,5	160	-	watts ←

Note 1: With dc filament voltage of 6.3 volts.

Note 2: With dc plate current of 20 ma. and dc grid voltage of -1 volt.

Note 3: With dc plate voltage of 2000 volts and dc grid voltage of -2 volts.

Note 4: With dc plate voltage of 200 volts and dc grid voltage of +50 volts.

Note 5: With dc plate voltage of 1500 volts; dc plate current of 175 ma; dc grid current of 34 to 50 ma; grid resistor of 3500 ± 10% ohms; and frequency of 15 Mc.

a Continuous Commercial Service.

b Intermittent Commercial and Amateur Service.

c Averaged over any audio-frequency cycle of sine-wave form.

d When two or more tubes are used precautions should be taken to balance the plate currents.

e For ac filament supply.

f Obtained by grid resistor of value shown or by partial self-bias methods.

g For effect of load resistance on grid current and driving power, refer to TUBE RATINGS — *Grid Current and Driving Power* in the General Section.

h Key-down conditions per tube without modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

j Obtained from fixed supply, by grid resistor, by cathode resistor, or by combination methods.

k The 811A is not recommended for oscillator service in applications involving wide variations in load. For such applications, the 812A with its low amplification factor is preferred because of its ability to oscillate over a wide range of load variation.

m The 811A can be biased by any convenient method. However, the use of a grid resistor is preferred because the bias is automatically adjusted as the load on the circuit varies. In those applications, such as are encountered in therapeutic equipment, where grid current and grid voltage may vary widely because of fluctuating loads, it is important to design equipment so that the maximum grid-current and grid-voltage ratings are never exceeded for any load.

n From a self-rectifying driver.

p From a driver with a rectified, unfiltered, single-phase, full-wave plate supply.

q "Single-Tone" operation refers to that class of amplifier service in which the input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

r Obtained preferably from a separate, well-regulated supply.

s Driver power output represents circuit losses and is the actual power measured at input to the grid circuit. The actual power required depends on the operating frequency and the circuit used.

t This value of useful power is measured at load of output circuit having indicated efficiency.

u "Two-Tone Modulation" operation refers to that class of amplifier service in which the input consists of two equal monofrequency rf signals having constant amplitude. These signals are produced in a single-sideband suppressed-carrier system when two equal-and-constant amplitude audio frequencies are applied to the input of the system.

v Referenced to either of the two tones and without the use of feedback to enhance linearity.

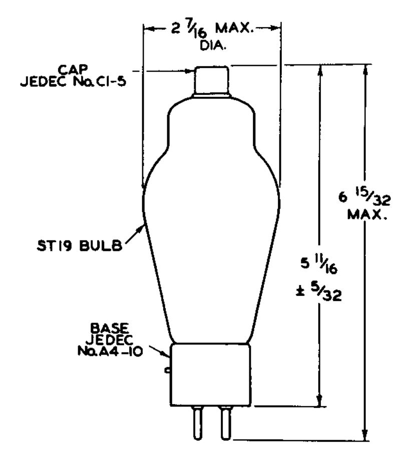
OPERATING CONSIDERATIONS

Plate shows no color when tube is operated at maximum CCS ratings, and shows a barely perceptible red color at maximum ICAS ratings.

← Indicates a change.

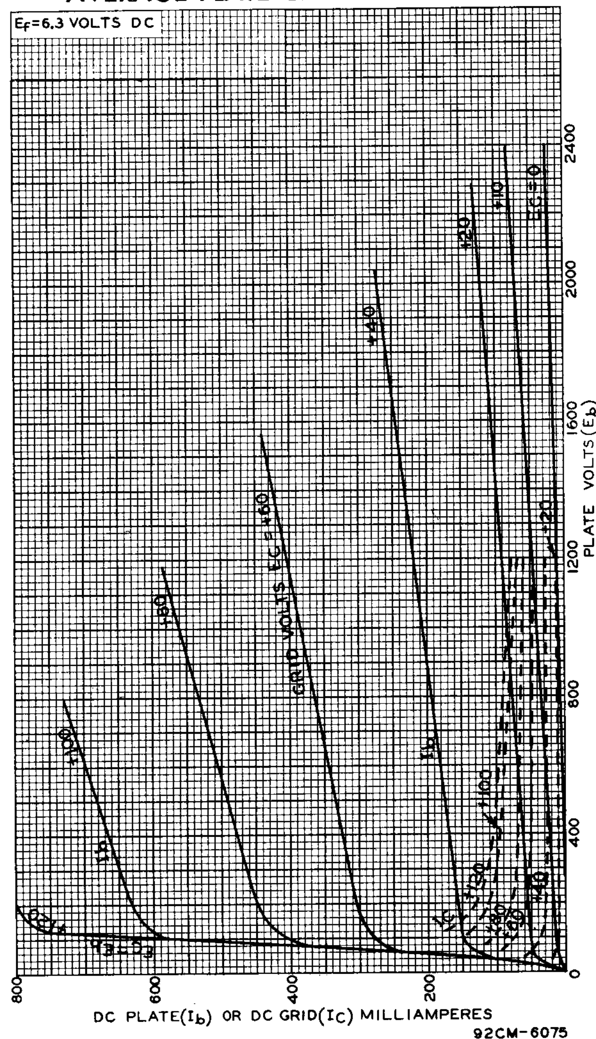
MAXIMUM RATINGS vs OPERATING FREQUENCY

OPERATING FREQUENCY Mc	MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM PLATE VOLTAGE & PLATE INPUT	
	TELEPHONY	TELEGRAPHY
	Class C Plate-Modulated	Class C
30	100	100
60	89	89
80	70	70
100	55	55

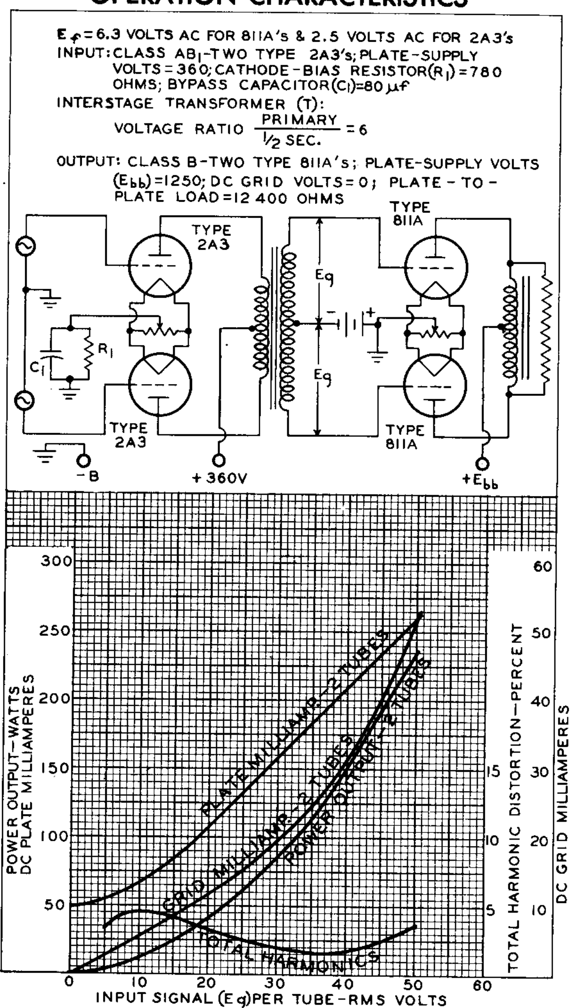


ALL DIMENSIONS IN INCHES

AVERAGE PLATE CHARACTERISTICS



OPERATION CHARACTERISTICS



OPERATION CHARACTERISTICS

E_f = 6.3 VOLTS AC FOR 811A's & 2.5 VOLTS AC FOR 2A3's
CIRCUIT ARRANGEMENT: SAME AS ON DWG.92CM-7138 UNDER TYPE 811A
INPUT: CLASS AB1-TWO TYPE 2A3's; PLATE-SUPPLY VOLTS = 360; CATHODE-BIAS RESISTOR (R_1) = 780 OHMS; BYPASS CAPACITOR (C_1) = 80 μf
INTERSTAGE TRANSFORMER (T):
VOLTAGE RATIO $\frac{\text{PRIMARY}}{\frac{1}{2}\text{ SEC.}} = 6$
OUTPUT: CLASS B-TWO TYPE 811A's; PLATE-SUPPLY VOLTS (E_{bb}) = 1500; DC GRID VOLTS = -4.5; PLATE-TO-PLATE LOAD = 12400 OHMS

POWER OUTPUT-WATTS
DC PLATE MILLIAMPERES
350
300
250
200
150
100
50

PLATE MILLIAMP-2 TUBES
POWER OUTPUT-2 TUBES
GRID MILLIAMP-2 TUBES
TOTAL HARMONICS

TOTAL HARMONIC DISTORTION-PERCENT
15
10
5

DC GRID MILLIAMPERES
60
50
40
30
20
10

0 10 20 30 40 50 60
INPUT SIGNAL (E_g) PER TUBE-RMS VOLTS

92CM-7139